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Complexity of word meanings: Diversity and unity in the world's languages

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I. Word meanings differ across languages

Stereotypically, languages can express the same meanings but have different words for these meanings, e.g. 'pocket' in different languages of Europe.



(*Intercontinental Dictionary Series*, Key & Comrie (eds.) <https://ids.cld.org/parameters/6-610>)

But languages may also have different meanings – words may have broader applicability or may be more narrow.

	'package'	'(paper) bag'	'bag'	'pocket'	'suitcase'
Russian	<i>paket</i>	<i>paket</i>	<i>sumka</i>	<i>karman</i>	<i>čemodan</i>
English	<i>package</i>	<i>bag</i>	<i>bag</i>	<i>pocket</i>	<i>bag</i>
German	<i>Paket</i>	<i>Tüte</i>	<i>Tasche</i>	<i>Tasche</i>	<i>Koffer</i>
French	<i>paquet</i>	<i>sac</i>	<i>sac</i>	<i>poche</i>	<i>valise</i>
Dutch	<i>pakket</i>	<i>zak</i>	<i>zak</i>	<i>zak</i>	<i>koffer</i>

Differences in meaning between different languages are best visualized by means of "semantic maps":



The term “**semantic map**” has been used for all kinds of things, but in cross-linguistic studies, it refers to diagrams that show a set of possible meanings and how different languages express them (Haspelmath 2003; Georgakopoulos & Polis 2018).

2. Semantic maps of grammatical markers

Comparative linguistics tends to be more interested in grammatical patterns than in lexical patterns, so semantic maps were first discussed in connection with grammatical markers.

For example, anticausative markers can have all kinds of additional meanings, e.g.

reflexive:

(36)	(a) izmenit' / izmenit'sja	"change(tr.) / change(intr.)"
RUSS	(b) pričesyvat'(-sja)	"comb (oneself)"
(37)	(a) réveiller / se réveiller	"wake(tr.) / wake(intr.)"
FREN	(b) (se) voir	"see (oneself)"
(38)	(a) rompere / romper-si	"break(tr.) / break(intr.)"
ITAL	(b) guardar(-si)	"look at (oneself)"
(39)	(a) verdiepen / zich verdiepen	"make / become deep"
DUT	(b) (zich) beschrijven	"describe (oneself)"

(Haspelmath 1987: 24)

passive:

(67) HUNG	ver-öd-ni	"be beaten"
(68) ARME	gr-v-el	"be written"
(69) UZBE	sakla-n-moq	"be preserved"
(70) GEOR	i-c'er-eba	"be written"
(71) PONA	dilip-ek	"(thatch) be repaired" (REHG 1981)
(72) ARAB	ta-rabbā	"be brought up / raised"

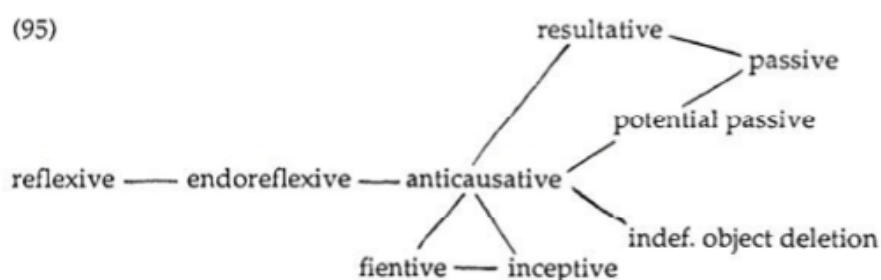
(Haspelmath 1987: 29)

fientive ('become'):

(86)	full-n-an	"become full"	<- fulls "full"
GOTH	mikil-n-an	"become great"	<- mikils "great"
(87)	saf-ik-	"become clean"	<- safi "clean"
SWAH	kamil-ik-	"become perfect"	<- kamili "perfect"
(88)	ince-l-mek	"become thin(ner)"	<- ince "thin"
TURK	boş-al-mak	"become empty"	<- boş "empty"
(89)	c'itl-d-eba	"becomes read"	<- c'iteli "read"
GEOR	cf. ANTIK/PASS	šen-d-eba "is built"	<- a-šen-eba "builds"

(Haspelmath 1987: 33)

The corresponding semantic map:



This was directly inspired by Bybee (1985: 195-196):

A universal study of grammatical meaning, then, could proceed as follows: working within a general area of semantic space (much as in L. Anderson 1982), a number of very specific grammatical functions can be identified on the basis of meaning and contextual factors. (For example, *progressive* and *continuous* markers have similar meanings, but they can be distinguished by the fact that *progressives* are restricted to *active verbs*.) Relations among these very specific functions can be studied, again following L. Anderson 1982, by determining cross-linguistically which functions can be covered by the same grammatical marker, and by studying the diachronic extension of a marker from one function to another. If we understand the nature of a relation of similarity between specific grammatical functions, then we are closer to understanding the nature of grammatical meaning.

Does this work for word meanings, too? Can we understand **the nature of word meanings** better if we apply the semantic-map method to lexical meanings?

(On a personal level, my association with Joan Bybee led me to think a lot about semantic maps, and my 2003 paper then became quite famous. See also Bahrt (2021) for a continuation of work on “voice syncretism”.)

3. Polysemy and indeterminacy of word meanings

Some words clearly have two different and unrelated meanings, e.g.

<i>port</i>	1. ‘harbour’ 2. ‘a type of wine from Portugal’
<i>seal</i>	1. ‘pinniped (a type of marine mammal)’ 2. ‘emblem for signatures’

But many words have several meanings that are clearly related, e.g.

<i>Tasche</i>	1. ‘bag’ 2. ‘pocket’	(German)
<i>see</i>	1. ‘experience a visual perception’ 2. ‘understand’	

We typically say that *port*₁ and *port*₂ are two different **homonymous** words, while *Tasche* is a single **polysemous** word.

But what about English *bag*? Is it polysemous?

<i>bag</i>	1. ‘Tasche’ 2. ‘Tüte’	(from a German point of view)
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For English speakers, these are probably not two different meanings – the English word *bag* is simply **indeterminate** (or vague) with respect to the distinction made by German (‘made of sturdy material’ vs. ‘made of paper’).

Does the semantic map help us understand **the nature of word meanings**?

NO

(at least not in any simple way)

The meanings that are used by semantic maps are not really **parts of languages** – they are means for comparing languages.

Cf. Bybee (1985):

“A number of very specific grammatical functions **can be identified...** Relations among these functions can be studied by determining cross-linguistically which **functions can be covered** by the same grammatical marker...”

These functions are not (necessarily) parts of the languages. Saying that the “can be identified” really means that such functions can be created as **methodological tools**.

4. More semantic maps, and “coexpression/colexification”

Let us look at a few more examples of semantic maps.

First, temporal-location markers (Haspelmath 1997: Ch. 7):

E128. French (three markers: *Ø, à, en*)

a. hour:	<i>à 5 heures</i>	'at five o'clock'
b. day part:	<i>au/Ø le matin</i>	'in the morning'
c. day:	<i>Ø mardi/Ø le premier</i>	'on Tuesday/on the first'
d. month:	<i>en juin</i>	'in June'
e. season:	<i>en hiver</i>	'in the winter'
f. year:	<i>en 1789</i>	'in 1789'
g. festival:	<i>à Pâques</i>	'at Easter'

E130. Hungarian (five markers: *-kor/Ø/-en/-Cal/-ban*)

a. hour:	<i>hat-kor</i>	'at six o'clock'
b. day part:	<i>este Ø</i>	'in the evening'
c. day:	<i>kedd-en</i>	'on Tuesday'
d. month:	<i>január-ban</i>	'in January'
e. season:	<i>tavas-szal</i>	'in the spring'
f. year:	<i>ez év-ben</i>	'this year'
g. festival:	<i>karácsony-kor</i>	'at Christmas'

The semantic map, with some distributional patterns:

Figure 32: *The implicational map for simultaneous location markers*

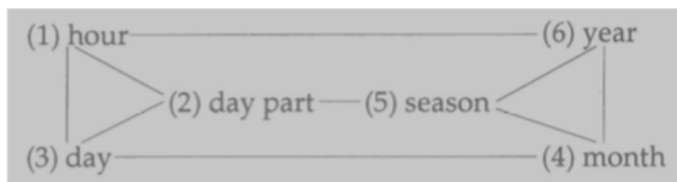


Figure 34: English

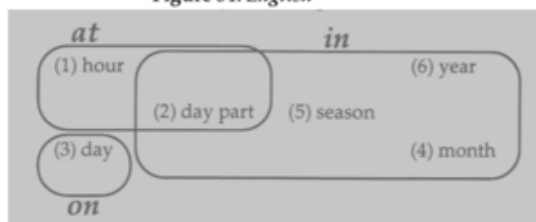


Figure 35: French

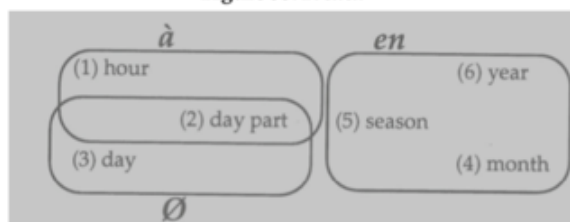


Figure 37: Hungarian

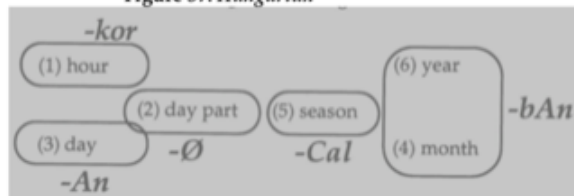
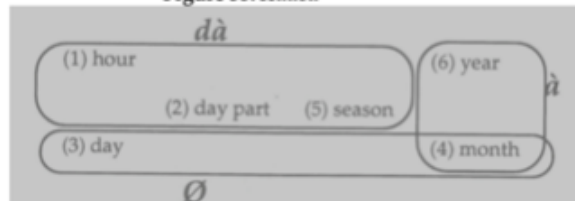


Figure 38: Hausa



In these maps, we say that a form that has multiple functions (or expresses multiple meanings) **coexpresses** these functions.

For example, English **at** coexpresses the hour function (*at five o'clock*) and the day part function (*at noon*), and French **en** coexpresses the year function (*en 2022*), the month function (*en mai*), and the season function (*en printemps*).

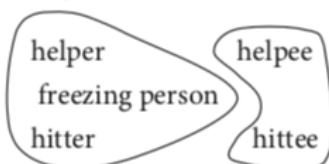
Another example shows a very large number of functions and their coexpression: 181 semantic-role types whose expression is coded in the **ValPaL database** (Hartmann et al. 2013; Hartmann et al. 2014).

Typologists typically say (in a simplified way) that accusative case expresses the patient (P), while nominative case coexpresses agent (A) and intransitive subject (S). But we can take a more fine-grained look at multiple verb types, e.g. 'help', 'hit', and 'freeze'. English coexpresses the role of the **helper**, the **hitter**, and the **freezing person** (nominative), and also the role of the **helpee** and the **hittee** (accusative).

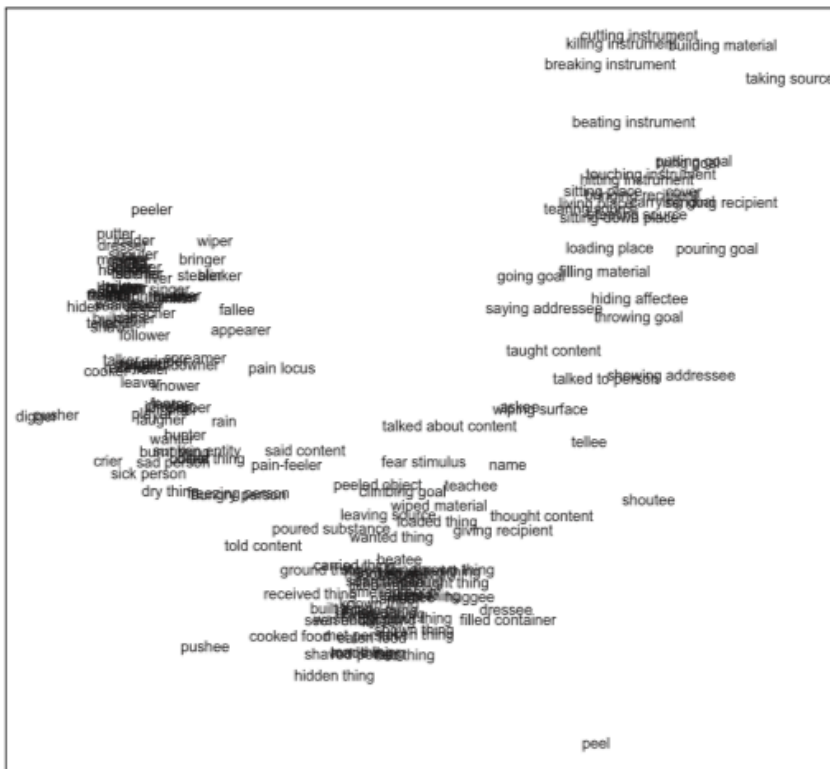
a. accusative



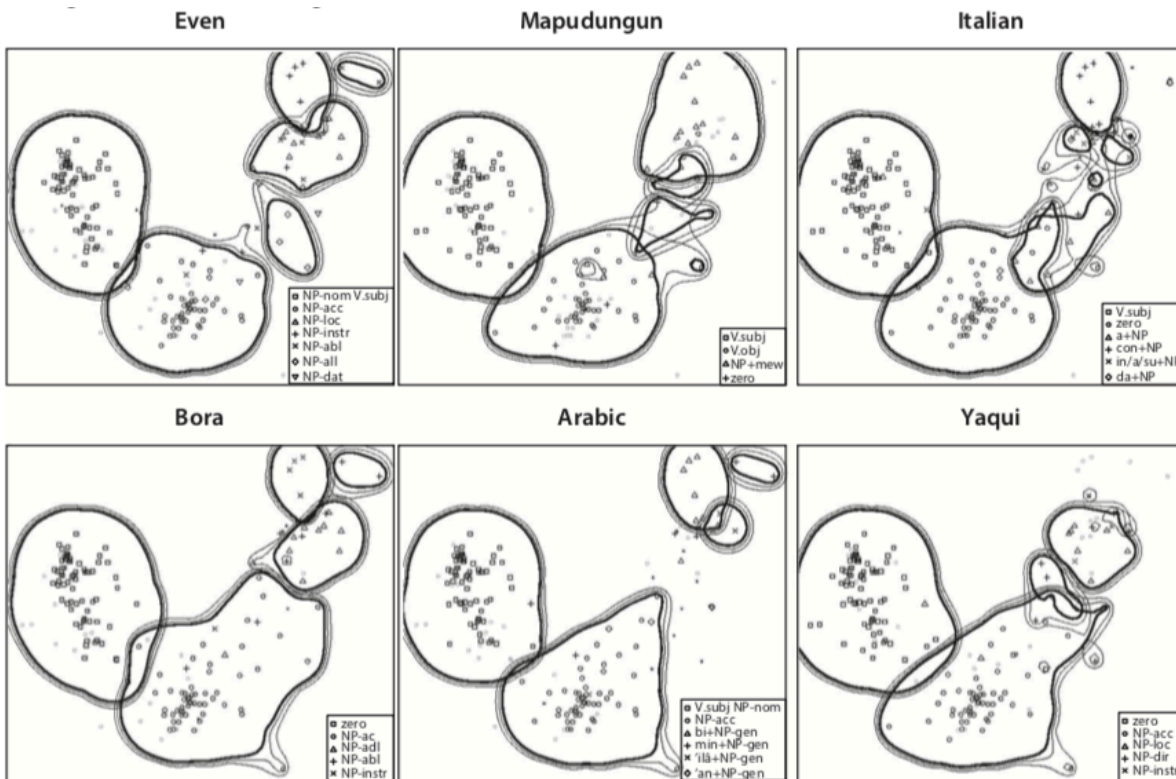
b. English



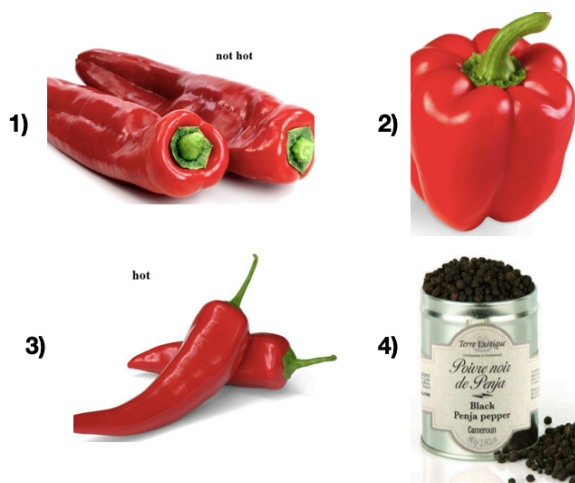
Extending this approach to 87 verb meanings and 181 semantic roles, we get this semantic map:



The diagrams below show the distribution of argument markers in a range of languages (Hartmann, Haspelmath, Cysouw 2014):



To get back to lexical coexpression, let us look at the “semantic map” of “peppers”:



French

- 1) *piment (doux)*
- 2) *poivron*
- 3) *piment*
- 4) *poivre*

Italian

- 1) *peperone*
- 2) *peperone*
- 3) *peperoncino*
- 4) *pepe*

Bosnian

- 1) *roga*
- 2) *babura*
- 3) *čili paprika*
- 4) *biber*

English

- 1) *sweet pepper*
- 2) *red pepper*
- 3) *chili pepper*
- 4) *black pepper*

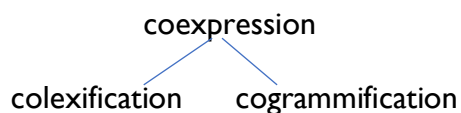
(Twitter-crowdsourced by Maria Zielenbach,
<https://twitter.com/dietweeterei/status/1437795984885616649>)

Again, we have different coexpression pattern in different languages. When the coexpression is by a **word** (a lexical item), we also say **colexification** (François 2008).

Italian <i>peperone</i>	colexifies	‘sweet pepper’ and ‘red pepper’
French <i>piment</i>	colexifies	‘sweet pepper’ and ‘chili pepper’
English <i>bag</i>	colexifies	‘Tasche’ and ‘Tüte’
Dutch <i>zak</i>	colexifies	‘Tasche’, ‘Tüte’ and ‘pocket’

In addition, to complete the paradigm, we can talk about **cogrammification**:

English ACCUSATIVE	cogrammifies	‘helpee’ and ‘hittee’
German DATIVE	cogrammifies	‘helpee’ and ‘give recipient’



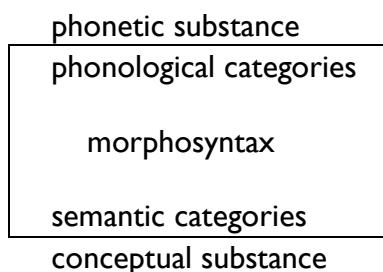
5. Which kinds of “meanings” are coexpressed?

One might think that when we say that a form *F* of a language *L* coexpresses meanings *A* and *B*, then these meanings must be meanings of language *L*, or maybe meanings that exist in some universal conceptual space.

But this is wrong. They are **comparison meanings**, and they are methodological tools used by linguists for comparative purposes.

“The meanings that are used by semantic maps are not really **parts of languages** – they are means for comparing languages.”

Linguistic forms are specific to each language, and so are meanings – our conceptual worlds may be largely the same, but the meanings (“**semantic categories**”) of our forms are often quite different:



More generally, comparison of languages relies on **comparative concepts** (Haspelmath 2010), which are instruments for general linguistics, not ingredients of languages themselves. They make reference to **phonetic and conceptual substance**, not to language-particular categories.

(Much of the confusions surrounding general linguistics over the last few decades can be explained by the conflation of categories for **describing** particular languages and concepts for **comparing** languages. Linguists have kept trying to describe and compare languages at the same time, but this is impossible; cf. Dryer 2006; Haspelmath 2021b.)

Comparative concepts for coexpression can be:

- meanings described in terms of some metalanguage (e.g. ‘pocket’, ‘Tüte’)
- meanings described by a picture (of a bag, or of a kind of pepper)
or by some other kind of nonverbal stimulus
- meanings occurring in parallel texts (e.g. in Bible translations, Wälchli & Cysouw 2012)
- collocational *contexts* (e.g. ‘on Friday’, ‘in spring’, ‘at noon’)

Comparative concepts are very diverse. All that is needed is that they are **identified in the same way for all languages**. In this way, they can be regarded as **uniform yardsticks** for “measuring” cross-linguistic variation.

Most linguists are primarily concerned with language-particular **description**, and not so much with **comparison** – they hope to extend their language-particular concepts to general linguistics, or apply categories from other languages to their own. But this doesn’t work. **Each language must be described in its own terms**, but descriptions can be **inspired** by cross-linguistic work (Haspelmath 2020a).

For this reason, it is a bit misleading to say that we study “**polysemy patterns**” – there is no reason to think that a word must be polysemous just because two of its uses are not colexified in some other language (“polysemy” seems to be intractable anyway; Geeraerts 1993; 2001).

“**Coexpression patterns**” is a much better term, and in technical contexts, semantic maps are better called “*coexpression diagrams*”.

6. Coexpression and synexpression

6.1. Beyond coexpression: More differences between languages

Ullmann (1953): French tends to have “unmotivated” words, while German has more motivated words:

French	German	
<i>dé</i>	<i>Finger-hut</i>	‘thimble’
<i>gant</i>	<i>Hand-schuh</i>	‘glove’
<i>patin</i>	<i>Schlitt-schuh</i>	‘skate’
<i>entrer</i>	<i>hinein-gehen</i>	‘enter’
<i>divorce</i>	<i>Scheid-ung</i>	‘divorce’

Seiler (1975): Cahuilla (Uto-Aztecan) has more “roundabout expression” than English

e.g.	English	Cahuilla	
	<i>stone</i>	<i>qáwiš</i>	‘what has become hard’
	<i>arrow</i>	<i>polut</i>	‘what has been stretched’
	<i>basket</i>	<i>néat</i>	‘what has been woven’

Languages “lexify” meanings in different ways – not just by using words with broader vs. narrower meanings, but also by **conflating** meaning components into simple forms in different ways (cf. Talmy 1985).

French	<i>Jimmy</i>	<i>a traversé</i>	<i>le pont</i>	<i>en courant.</i>
English	<i>Jimmy</i>	<i>ran</i>	<i>across</i>	<i>the bridge.</i>
	<i>traverser</i>	‘motion + orientation’		
	<i>run</i>	‘motion + manner’		

Conflation is different from coexpression – we need a new term: **synexpression**.

6.2. Recapitulating coexpression terminology

- (1) **colexification** (of two meanings A and B):
= expression of either A **or** B by a root (= a minimal lexical form; Haspelmath 2020b)
- (2) **cogrammification** (of two meanings A and B):
= expression of either A **or** B by a grammatical marker
- (3) **coexpression** (of two meanings A and B):
= expression of either A **or** B by a form or construction

<i>colexification</i> :	coined by François (2008)
<i>coexpression</i> :	coined by Hartmann et al. (2014)
<i>cogrammification</i> :	coined in March 2022 in Liège

- (4) **coexpression diagram**
= a graphic representation of possible coexpression types

Coexpression diagrams are widely known as “semantic maps”
(e.g. Georgakopoulos & Polis 2018).

- (5) language L **dislexifies** meanings A and B (François 2022)
= there are two different lexical forms (G and H) for A and B

e.g. Dutch **colexifies** ‘bag’ and ‘pocket’ (zak)
English **dislexifies** ‘bag’ and ‘pocket’ (bag, pocket)

6.3. Introducing **synexpression** (coined in March 2022)

- (6) **syngammification** (of two meanings A and B):
= expression of both A **and** B in a grammatical marker (“synthetically”)

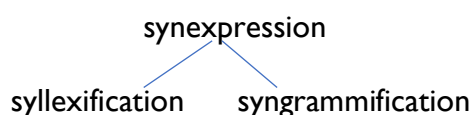
e.g. Latin *libr-orum*
book-PL.GEN
‘of book-s (plural + genitive)’

- (7) **sylllexification** (of two meanings A and B):
= expression of both A **and** B in a root (= a minimal lexical form)

e.g. French *traverser*
‘move + across’

e.g. English *worse*
‘more + bad’

- (8) **synexpression** (of two meanings A and B):
= expression of both A and B in a form or construction



(*synexpression diagram)

- (9) **circumexpression:**

language L **circumlexifies** meanings A and B
= there are two cooccurring lexical forms (F + G) corresponding A and B

Ježek (2016: 7-8)

“synthetic” Italian vs. “analytic English”
(sylllexifying) (circumlexifying)

cenare *have + dinner*
tardare *be + late*
addormentarsi *fall + asleep*

Thus, for Talmy’s (1985) “lexicalization patterns”, it is better to talk about **lexification patterns**.

7. What explains the limits on coexpression and synexpression?

7.1. Coexpression: Similarity, or language change?

A. Conceptual closeness (similarity) may explain coexpression

John Haiman's **Isomorphism Hypothesis**:

“Different forms will always entail a difference in communicative function. Conversely, recurrent identity of form between different grammatical categories will always reflect some perceived similarity in communicative function” (Haiman 1985: 19).

William Croft's “**conceptual space**” view: semantic maps give us access to...

“the geography of the human mind, which can be read in the facts of the world's languages in a way that the most advanced brain scanning techniques cannot even offer us” (Croft 2001: 364)

B. Likelihood of diachronic semantic extension may explain coexpression

Sonia Cristofaro's **source-oriented** proposal (2010):

coexpression is explained by tendencies of language change
(i.e. this is a mutational explanation; Haspelmath 2019)

7.2. Synexpression: High frequency

It seems that in general, across a wide range of synexpression patterns, we can explain synexpression by high absolute frequency:

e.g. kinship terms	<i>padre vs. madre</i>	<i>herman-o vs. herman-a</i> (Spanish)
e.g. male-female animals	<i>dog vs. bitch</i>	<i>lion vs. lion-ess</i>
e.g. comparatives	<i>bad vs. worse</i>	<i>expensive vs. more expensive</i>
e.g. quality nouns	<i>big vs. size</i>	<i>narrow vs. narrow-ness</i>
e.g. ordinal numerals	<i>one vs. first</i>	<i>seven vs. seven-th</i>
e.g. person & number	Russian <i>ty vs. vas</i>	<i>on vs. oni</i> (you.SG/you.PL, 'he/they')
e.g. number & case	Latin <i>ego vs. me</i>	<i>nos vs. nos</i> ('I/me', 'we/us')

Moreover, it seems clear that different cultural preferences lead to different syllexification tendencies in particular domains, e.g. rich kinship terms in languages which use kinship terms frequently:

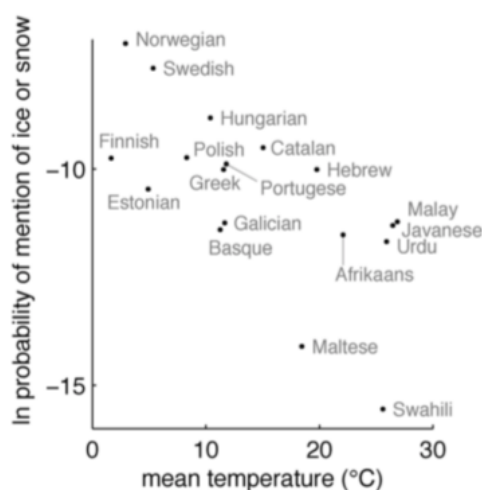
Evans (2011):

	♂ referent		♀ referent		
	♂ speaker	♀ speaker	♂ speaker	♀ speaker	
(elder)	1	3	5	7	
(younger)	2	4	6	8	
(elder)	brother		sister		English
(younger)					
(elder)	kakang				Indonesian
(younger)	adik				
(elder)	ani		otōto		Japanese
(younger)	ane		imōto		
(elder)	thabuju	kularrind	kularrind	yakukathu	Kayardild
(younger)	duujind	kularrind	kularrind	duujind	

Or rich terms for ‘frozen water’ in languages spoken at different latitudes, in areas with different average temperatures (Regier et al. 2016):



Speakers of languages like Swedish actually do speak more about snow or ice than speakers of languages like Maltese, at least on Twitter:



7.3. Frequency may be relevant also to coexpression

A final observation
(and challenge for future research):

If a language makes **more fine-grained distinctions** with its morphs than another one (e.g. English *snow* vs. *ice*, French *entrer* ‘go in’ vs. *sortir* ‘go out’, Japanese *otōto* ‘elder sister’ vs. *imōto* ‘younger sister’),

then often this also means that there is **less colexification** (and more dislexification) – and if syllexification (= making fine-grained distinctions) is due (in part) to frequency of use, then **frequency is relevant also to colexification**.

Thus, frequency of use seems to be important not only for asymmetric coding (“markedness”; see Haspelmath 2021a), but also for understanding coexpression and synexpression patterns.

References

- Anderson, Lloyd B. 1982. The “perfect” as a universal and as a language-particular category. In Hopper, Paul J. (ed.), *Tense-aspect: Between semantics and pragmatics*, 227–264. Amsterdam: Benjamins.
- Bahrt, Nicklas N. 2021. *Voice syncretism*. Language Science Press. Language Science Press. (<https://langsci-press.org/catalog/view/315/3359/2373-1>)
- Bybee, Joan L. 1985. *Morphology: A study of the relation between meaning and form*. Amsterdam: Benjamins.
- Cristofaro, Sonia. 2010. Semantic maps and mental representation. *Linguistic Discovery* 8(1). 35–52. (doi:10.1349/PSI.1537-0852.A.345)
- Croft, William. 2001. *Radical Construction Grammar: Syntactic theory in typological perspective*. Oxford: Oxford University Press.
- Cruse, D. Alan. 2000. Aspects of the micro-structure of word meanings. In Ravin, Yael & Leacock, Claudia (eds.), *Polysemy: Theoretical and computational approaches*, 30–51. Oxford: Oxford University Press.
- Dryer, Matthew S. 2006. Functionalism and the theory-metalanguage confusion. In Wiebe, Grace & Libben, Gary & Priestly, Tom & Smyth, Ron & Wang, Sam (eds.), *Phonology, morphology, and the empirical imperative: Papers in honour of Bruce Derwing*, 27–59. Taipei: The Crane Publishing Company. (<http://www.acsu.buffalo.edu/~dryer/foundation.htm>)
- Evans, Nicholas. 2011. Semantic typology. In Song, Jae Jung (ed.), *The Oxford handbook of linguistic typology*, 504–533. Oxford: Oxford University Press.
- François, Alexandre. 2008. Semantic maps and the typology of colexification: Intertwining polysemous networks across languages. In Vanhove, Martine (ed.), *From polysemy to semantic change: Towards a typology of lexical semantic associations* (Studies in Language Companion Series 106), 163–216. Amsterdam: Benjamins.
- François, Alexandre. 2022. Lexical tectonics: Mapping structural change in patterns of lexification. (*to appear*).
- Geeraerts, Dirk. 1993. Vagueness’s puzzles, polysemy’s vagaries. *Cognitive Linguistics* 4(3). 223–272. (doi:10.1515/cogl.1993.4.3.223)
- Geeraerts, Dirk. 2001. The definitional practice of dictionaries and the cognitive semantic conception of polysemy. *Lexicographica* 17. 6–21.
- Georgakopoulos, Thanasis & Polis, Stéphane. 2018. The semantic map model: State of the art and future avenues for linguistic research. *Language and Linguistics Compass* 12(2). e12270. (doi:10.1111/lnc3.12270)
- Haiman, John. 1985. *Natural syntax: Iconicity and erosion*. Cambridge: Cambridge University Press.
- Hartmann, Iren & Haspelmath, Martin & Taylor, Bradley (eds.). 2013. *The Valency Patterns Leipzig online database*. Leipzig: Max Planck Institute for Evolutionary Anthropology. (<https://valpal.info/>)
- Hartmann, Iren & Haspelmath, Martin & Cysouw, Michael. 2014. Identifying semantic role clusters and alignment types via microrole coexpression tendencies. *Studies in Language* 38(3). 463–484. (doi:<https://doi.org/10.1075/sl.38.3.02har>)
- Haspelmath, Martin. 1987. *Transitivity alternations of the anticausative type* (Arbeitspapiere Des Instituts Für Sprachwissenschaft N.F. Nr. 4). Cologne: Universität zu Köln. (<http://doi.org/10.5281/zenodo.225196>)
- Haspelmath, Martin. 1997. *From space to time: Temporal adverbials in the world’s languages*. Munich: Lincom Europa.
- Haspelmath, Martin. 2003. The geometry of grammatical meaning: Semantic maps and crosslinguistic comparison. In Tomasello, Michael (ed.), *The New Psychology of Language*, vol. 2, 211–243. New York: Lawrence Erlbaum. (10.5281/zenodo.831410)
- Haspelmath, Martin. 2010. Comparative concepts and descriptive categories in crosslinguistic studies. *Language* 86(3). 663–687. (doi:10.1353/lan.2010.0021)
- Haspelmath, Martin. 2020a. The structural uniqueness of languages and the value of comparison for description. *Asian Languages and Linguistics* 1(2). 346–366. (doi:10.1075/alal.20032.has)
- Haspelmath, Martin. 2020b. The morph as a minimal linguistic form. *Morphology* 30(2). 117–134. (doi:10.1007/s11525-020-09355-5)

- Haspelmath, Martin. 2021a. Explaining grammatical coding asymmetries: Form-frequency correspondences and predictability. *Journal of Linguistics* 57(3). 605–633. (doi:10.1017/S0022226720000535)
- Haspelmath, Martin. 2021b. General linguistics must be based on universals (or nonconventional aspects of language). *Theoretical Linguistics* 47(1–2). 1–31. (doi:10.1515/tl-2021-2002)
- Ježek, Elisabetta. 2016. *The lexicon: An introduction*. Oxford: Oxford University Press.
- Key, Mary Ritchie & Comrie, Bernard (eds.). 2021. *IDS*. Leipzig: Max Planck Institute for Evolutionary Anthropology. (<https://ids.cld.org/>) (Accessed March 16, 2022.)
- List, Johann-Mattis & Greenhill, Simon J. & Anderson, Cormac & Mayer, Thomas & Tresoldi, Tiago & Forkel, Robert. 2018. CLICS2: An improved database of cross-linguistic colexifications assembling lexical data with the help of cross-linguistic data formats. *Linguistic Typology* 22(2). 277–306. (doi:10.1515/lingty-2018-0010)
- Regier, Terry & Carstensen, Alexandra & Kemp, Charles. 2016. Languages support efficient communication about the environment: Words for snow revisited. *PLOS ONE* 11(4). e0151138. (doi:10.1371/journal.pone.0151138)
- Seiler, Hansjakob. 1975. Die Prinzipien der deskriptiven und etikettierenden Benennung. In Seiler, Hansjakob (ed.), *Linguistic Workshop III*, 2–57. München: Fink.
- Talmy, Leonard. 1985. Lexicalization patterns. In Shopen, Timothy (ed.), *Language typology and syntactic description (Volume III)*, 57–149. Cambridge: Cambridge University Press.
- Ullmann, Stephen. 1953. Descriptive semantics and linguistic typology. *Word* 9(3). 225–240.
- Wälchli, Bernhard & Cysouw, Michael. 2012. Lexical typology through similarity semantics: Toward a semantic map of motion verbs. *Linguistics* 50(3). 671–710.